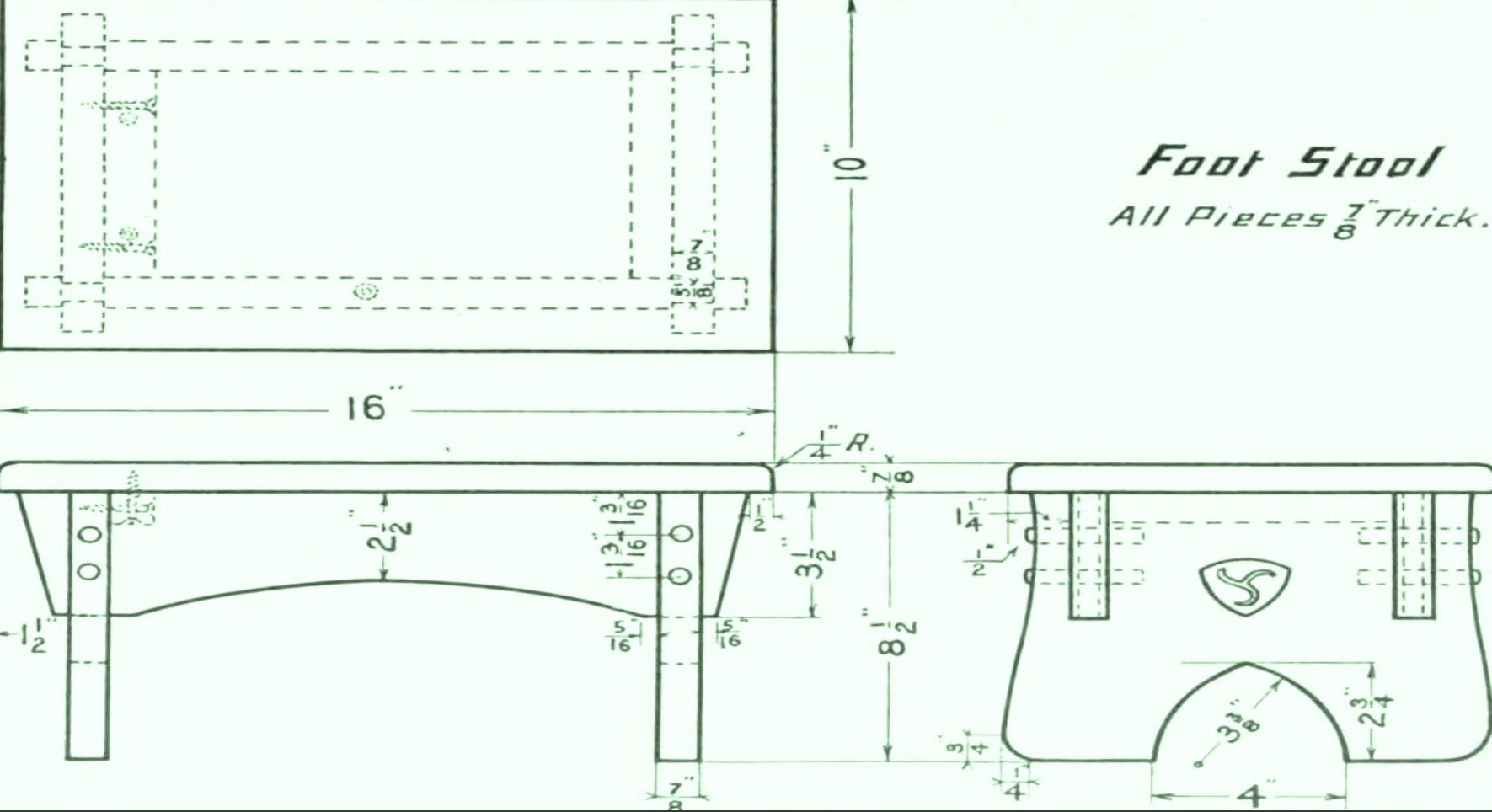

Problems in woodworking
Michael William Murray
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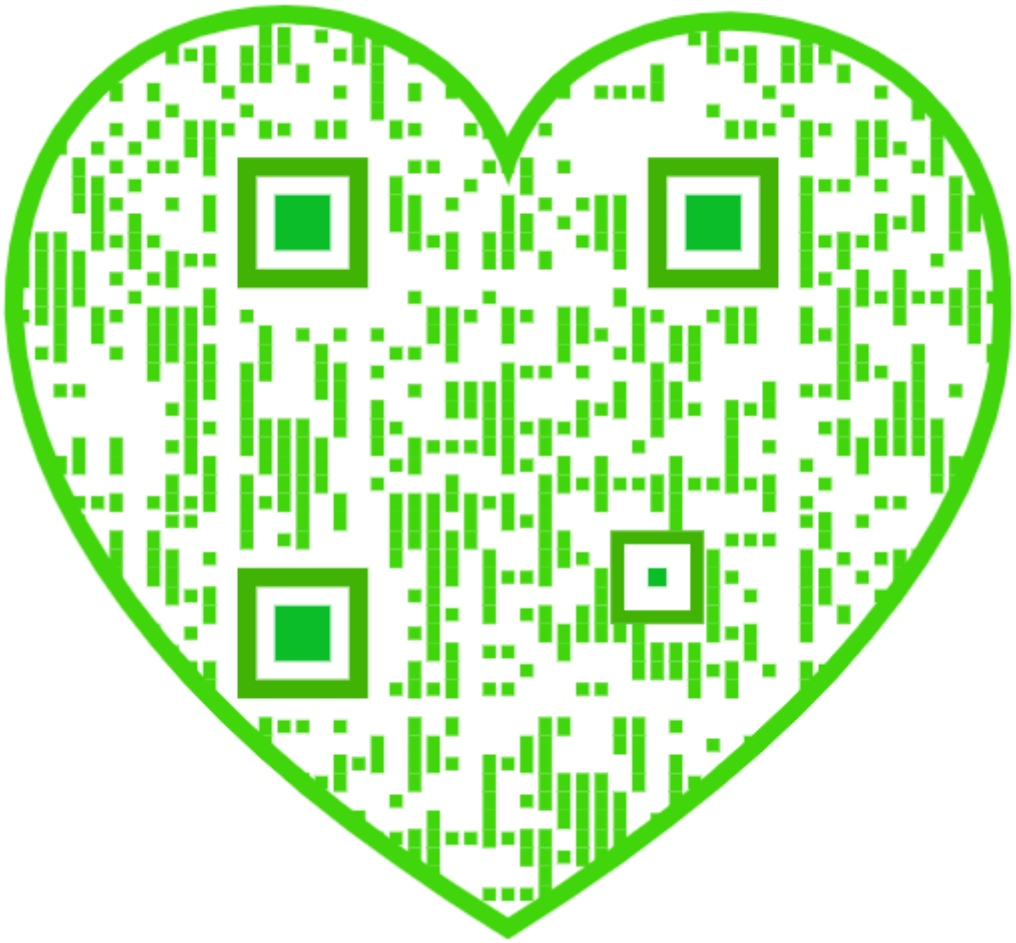

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Problems in Woodworking

By M. W. MURRAY

The Manual Arts Press

Peoria, Illinois

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PROBLEMS IN WOODWORKING

BY M. W. MURRAY

SECOND THOUSAND

THE MANUAL ARTS PRESS

PEORIA, ILLINOIS

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FOREWORD

A REALIZATION of the difficulty in obtaining drawings of good models which can be given as class exercises has led to the preparation of these problems. The aim has been to save teachers the labor of making drawings and blue prints of models, many of which are in general use at the present time.

No attempt has been made to plan a course of study or to arrange the models with any special regard to a logical order of exercises, but for convenience they have been grouped by grades. No models have been included which have not been successfully made by boys in the three upper grammar grades.

It is not intended that artisans or others with little or no experience in teaching and less knowledge of educational principles shall use these drawings and labor under the mistaken idea that they are teaching manual training. In putting these drawings into the hands of teachers, it is hoped that the effect may be to provide additional time for the solution of new problems instead of tending to make the work more definitely formal and lifeless. In the hands of the progressive teacher, there will be little danger of the latter.

Many of the problems can be presented to the class and worked out in various ways, according to the individuality of the different pupils. Whenever possible, the work should be correlated with the regular work of the school — the science, arithmetic, written work, physical training, and especially the drawing or art work. Such a plan results in a great saving of time to the manual-training teacher while it gives more life to other subjects.

The sources of the models have been acknowledged as far as possible on the plates, but special mention is made of the number of drawings used by permission of Gustaf Larsson, principal of the Sloyd Training School, Boston, Mass. In the preparation of the work the criticisms of Charles A. Bennett, editor of the Manual Training Magazine, have been especially helpful and suggestive.

June 26, 1905.

M. W. MURRAY, Springfield, Mass.

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LIST OF PLATES

The following arrangement of problems by grades is made for convenience in selecting models for class and individual use and may aid in planning courses of study.

GRADE VII

1. Hat-rack
2. Broom Holder
3. Sleeve-board
4. Shelf
5. Whisk-broom holder
6. Stationery box
7. Footstool (with padded top)
8. Knife-polishing box
9. Blotter
10. Toothbrush holder
11. Solitaire board
12. Pressing-board (for butterflies)

GRADE VIII

1. Coat hanger
2. Flower-pot stand
3. Key-boards
4. Pen-tray
5. Box
6. Flower table
7. Bench-hook
8. Drawing-board and T-square
9. Knife-box
10. Desk-tray
11. Taboret
12. Canoe paddle

GRADE IX

1. Tool-rack
2. Coat-and-trousers hanger
3. Bread-board
4. Book shelves
5. Umbrella stand
6. Printing frame
7. Towel-roller
8. Mirror
9. Footstool
10. Plate-rack
11. Towel-rack
12. Folding table
13. Medicine cabinet
14. Dovetailed book-rack
15. Book-rack
16. Boat

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NOTES ON PROBLEMS

The suggestions and comments embodied in the following notes are based on several years' experience, and it is hoped that they may prove helpful in connection with the problems.

GRADE VII.

Hat-rack. The need of a model which emphasizes the process of planing has led to the selection of the hat-rack. It has been used most successfully when the pupils have had for the preceeding and first piece, such a model as the plant support (18x1x½ inches made from stock 18½ x2x⅞ inches) on which they have worked off part of their surplus energy and are willing to make something with greater care. The holes in the hat-rack are made 16 inches apart because the studs in modern houses are that distance on centers.

Broom Holder. This model gives drill in planing with the additional exercises of laying out the corners and sawing to the knife and gauge lines. To these are added the laying out and cutting the opening for the broom. A good way to work out this recess is to bore two ¾-in. holes and after cutting away the wood with a turning saw, finish to the lines with a ¾-in. inside bevel gouge for the concave parts and the chisel on the convex. It may in some cases be necessary to use the knife before sand-papering and the pupils can be shown that the best work is made ready for sand-paper with the edged tools, not torn away with a file. Where boys are not capable of working out the opening it can be omitted and the piece used for a shelf and brush rack by putting in three hooks on the under side.

Sleeve-board. The size may be varied according to need, and a base added if desired. The edges may be made half-round, thus giving opportunity for an exercise in chamfering, but this has been found too difficult when the model is used in the first part of the seventh grade.

Shelf. Special emphasis is laid on the nailing exercises which this problem presents. The model gives an opportunity to design the back and bracket and to vary the size.

Whisk-broom Holder. This problem has been used successfully in connection with the drawing work. The pupils design the back and make a working drawing in the studio, and then construct the model in the manual-training room.

Stationery Box and Footstool (with padded top). These are good for the last pieces in the seventh grade.

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They also prove satisfactory models in other grades for Christmas presents.

Footstool. A problem which can be given to "repeaters" who may not be very good workmen, is presented in the foot-stool. It is a simple piece, all planing being straight, and the nailing and screwing requiring no special skill. The ends or legs, which may be designed, are clamped to the frame and made to stand true before screwing together.

Solitaire Board. Exercises in laying out and beveling are provided in this game board. It is a good piece to make at Christmas or at the end of the year when little time remains, as it can be made very quickly. A large number of games which can be played on the board is to be found in Every Boy's Manual, published by G. Routledge & Son, 1877. London and New York.

Blotter. The rocker part may be made from a $\frac{7}{8}$-inch piece of white pine by veneering the edges with $\frac{1}{4}$-inch mahogany. A design may be worked out on the top with a veining tool as suggested. It is a piece which requires considerable accuracy but is adapted to any grade.

Toothbrush Holder. In this model the drawing and the manual training are correlated. The aim is to make as hygienic a toothbrush holder as possible. When the problem was worked out in classroom, the pupils agreed that the brushes should not touch one another nor the woodwork, and that the part to catch the drippings should be of such material that it could be easily cleaned, hence the copper work. Snip shears are used for cutting the copper which is so light that it bends readily with a pair of square-nosed pliers.

GRADE VIII.

Coat Hanger. This has proved a good model for the first one in the eighth grade because it furnishes an opportunity to review planing before working out the shape. Some teachers have had the boys measure their shoulders and make the model to fit their coats. Such a plan has merit, in that it encourages individual work.

Flower-pot Stand. Special stress is laid on the planing, laying out and the cutting of the joint. The application of this joint to other and larger pieces, such as the base of a revolving bookcase, a kite frame, etc., should be shown. The boy should, of course, be taught to plane the wood for the model in one long piece to save time and material.

Key-board. The boys should make their own designs, having in mind the fact they must be related to the

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hooks. These designs may be made at home or in school, and after being approved, may, if desired, be worked out at home with veining-tool loaned for the purpose.

Pen-tray, Desk-tray. Either may be used for the first gouging.

Box. Any kind or size may be made. The hinge and catch may be designed, then worked out and fastened on with escutcheon pins. In working the copper (25 gauge, soft) the only tools required are snip shears, small safe-edge file, a light hammer and pliers. The holes can be made with any sharp tool. In working up the joint over a brad, the copper becomes hard enough to make a durable hinge.

Bench-hook, Drawing-board and T-square. These are pieces which require considerable skill and appeal to pupils who use such tools at home.

Flower Table, Taboret. Both are good problems for pupils who are not capable of making a mortise-and-tenon joint. The curved legs of the table may be laid out on one piece of wood with very little waste of material.

Canoe Paddle. This is an excellent piece of form work which may be made from straight-grained spruce, maple or ash, the first being found the best for school work. The length of the paddle should be determined by the height of the user. A bow paddle should usually be shorter than a stern paddle. The dimensions given have been found good for general work. If necessary accuracy of measurement should be sacrificed to good curves. The plan should be carefully drawn on the broad surface and cut; then the elevation should be made. The blade should be planed out while the handle is square. It has been found convenient to have one or more old-style wooden planes with their bottoms planed off to fit the shape of the paddle, and the irons ground to suit the bottoms, for working out around the rib on the blade, but this is not necessary as it can be done with the gouge, spoke-shave and plane.

GRADE IX.

Coat-and-Trousers Hanger. The combination of a good model and a useful article is found in this problem. If the wood for the back is first planed to $18 \times 3\frac{3}{4} \times 1\frac{1}{2}$ inches, the blocks in which the cross-piece slides can be cut from the upper corners. The grooves should be laid out with the gauge and try square and cut out with the back-saw and chisel.

Book Shelves. These may be designed to stand in

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the center of a table, on a table against the wall, or to hang on the wall.

Mirror. The recess for the back can be worked out by using a washer cutter, Forstner bit and chisel.

Boat. It is much more profitable for boys to design their own boats, and additional interest is created when several are made and raced. Since many boys are working at home with electric motors and small steam-engines. it is a good plan to encourage the building of power boats. It has not been found practicable to make such boats less than 34 inches long, as they will not hold the motors, batteries, etc.

Approximate rules for designing sail boats:

The *width* should not be more than one-third of the length and in case of boats 24 inches or less not much under one-third the length.

The *mast* may be placed one-third or half way between one-third and one-half way from the bow.

In making the *hull*, it is desirable to work to centre lines, laying out and cutting the deck plan first, then the sheer plan and lastly shaping the hull, finishing it smooth before boring and gouging out the inside. After the inside is finished, the sheer of the deck may be cut.

When the keel has been screwed on and the inside of the boat painted (this should always be done if the stock has been glued up) the deck may be glued and nailed in place.

The amount of lead for a model yacht may be determined when the hull is finished by putting in sufficient weight to sink it to the load water line and then weighing what has been used.

The lead may be cast in moulds either of wood, plaster-of-paris or sand, by first making a wooden pattern of the right size and shape. The wooden mould has been found very satisfactory. It is made by taking two pieces of wood about 2 inches longer than the pattern, the same width as the pattern, and from $\frac{1}{2}$ to $\frac{7}{8}$ of an inch thick, and cutting one-half the shape of the pattern out of each piece. The line made by the meeting of the two broad faces should correspond to the center line which runs lengthwise through the pattern. When this is done, the two halves of the mould are fastened together and pieces nailed to the top and bottom. Two $\frac{3}{16}$-inch dowels should extend through the mould from top to bottom, to form the holes for the screws which fasten the lead to the upper keel. In addition to this the top should have a pouring hole and one or more vent holes. The size of the pattern from which the mould is made may be figured on the basis of a cubic inch of cast lead weighing .408 pounds. (A piece of lead 2x1x$\frac{1}{2}$-inches also weighs .408 pounds, etc.)

The deck and spars should be finished with spar varnish.

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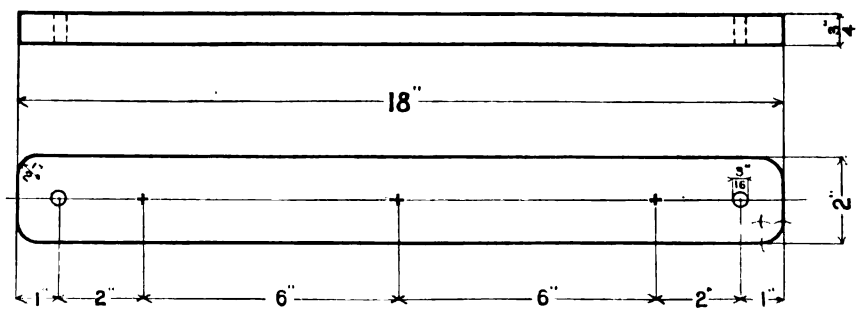
Hat Rack



No. 123 Coat & Hat Hooks used at +.

A. Miller, Boston, Mass.

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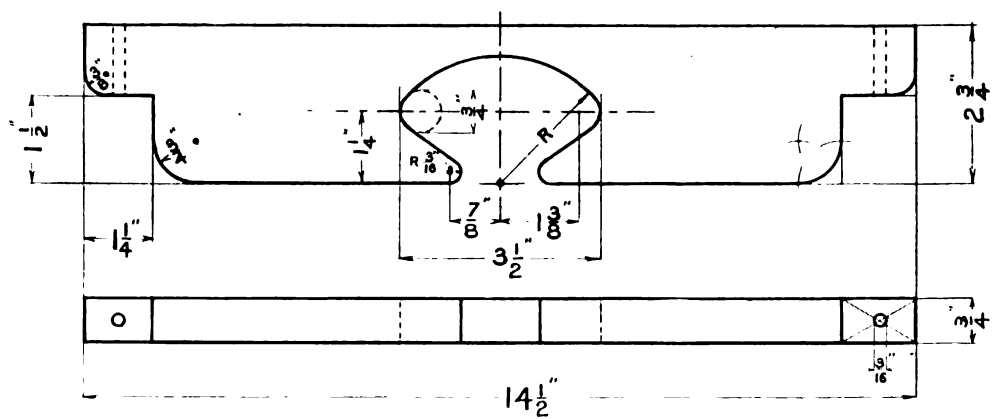
Broom Holder



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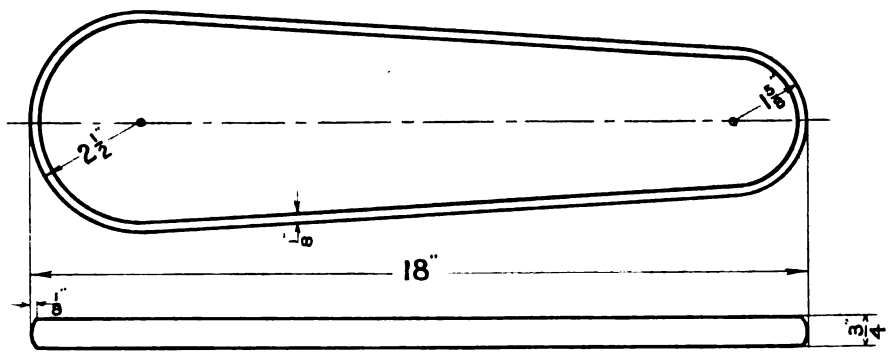
Sleeve Board



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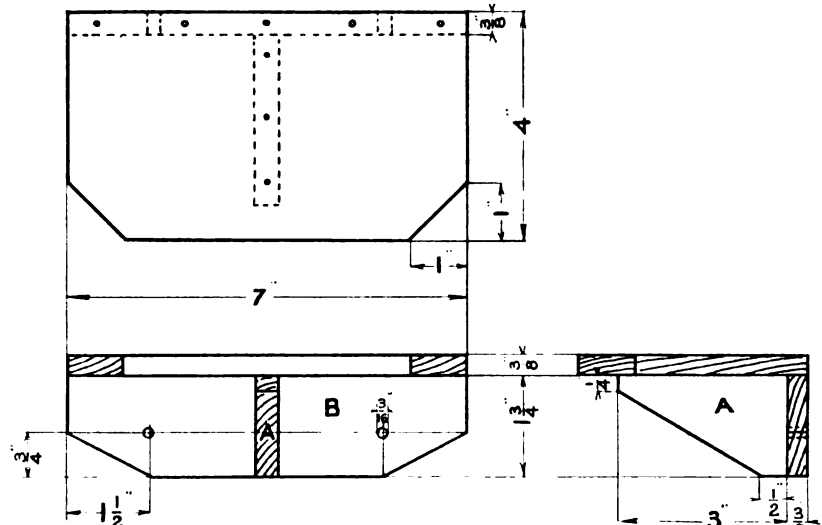
Shelf



A and B may be designed.

M.W.M.

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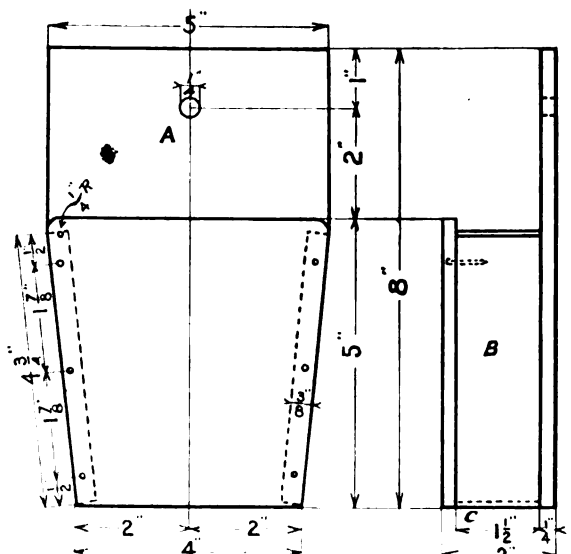
Whisk Broom Holder



Back A to be designed. Sides B may be tapered to 1 1/4" at C.

M.W.M

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Stationery Box

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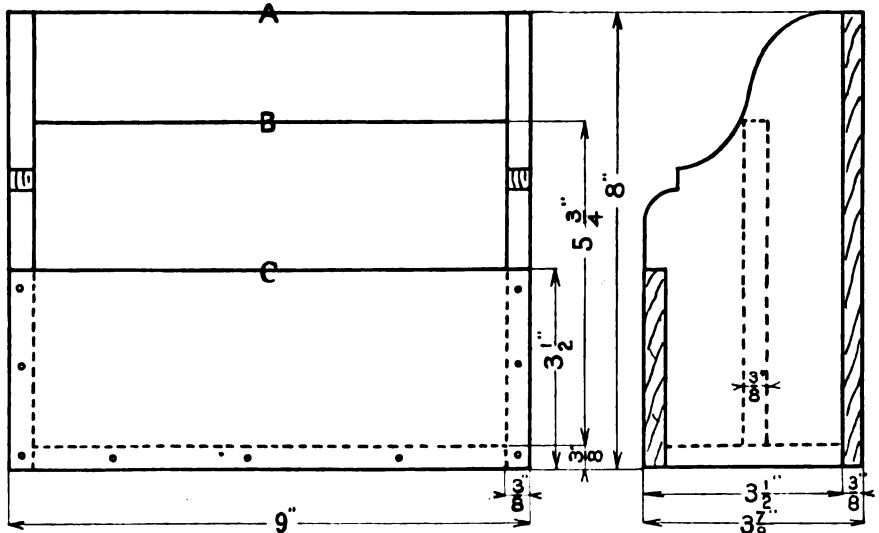

This box may be made 11½" long to take 8"x10" paper.
Edges A, B & C to be designed.

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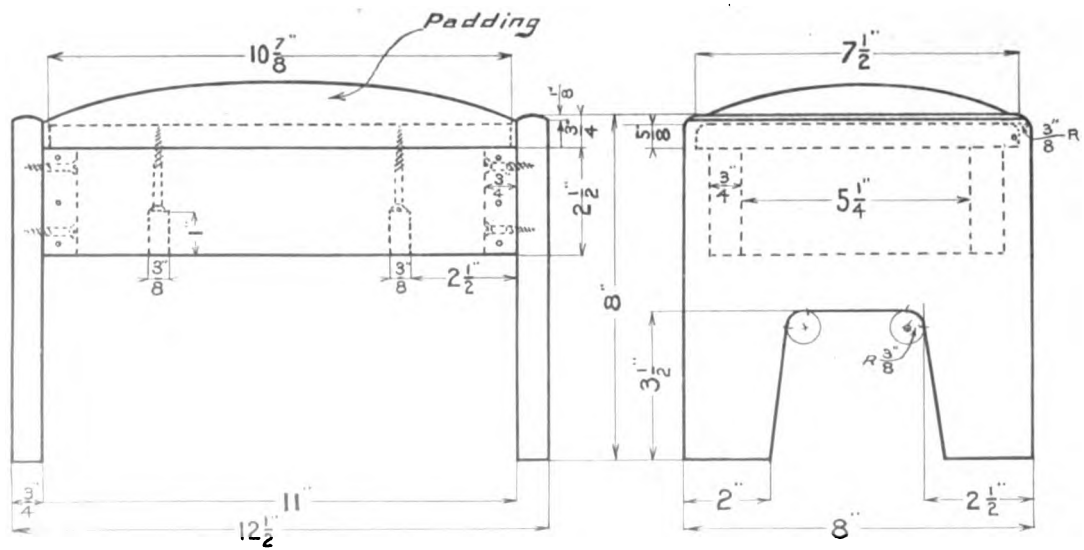
Foot Stool



F.P. Lane, Springfield, Mass.

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Knife Polishing Box

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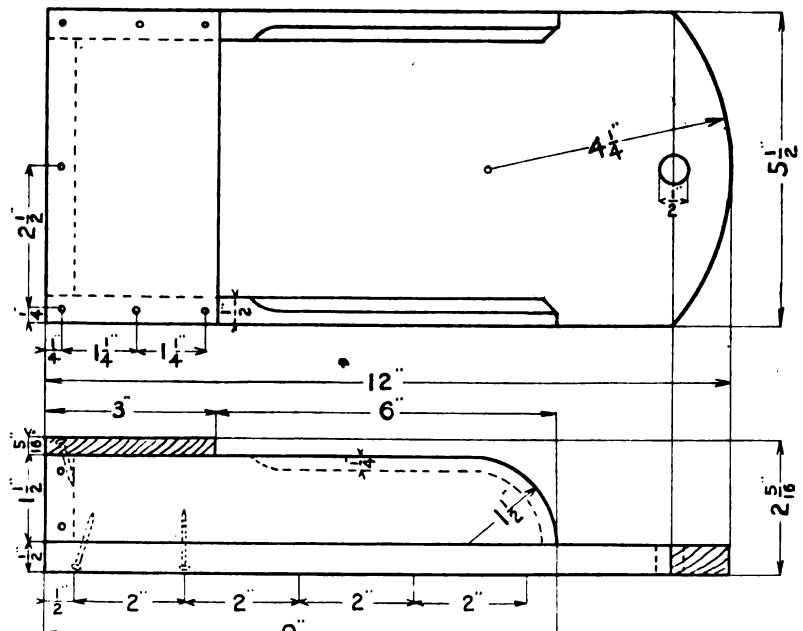

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Blotter

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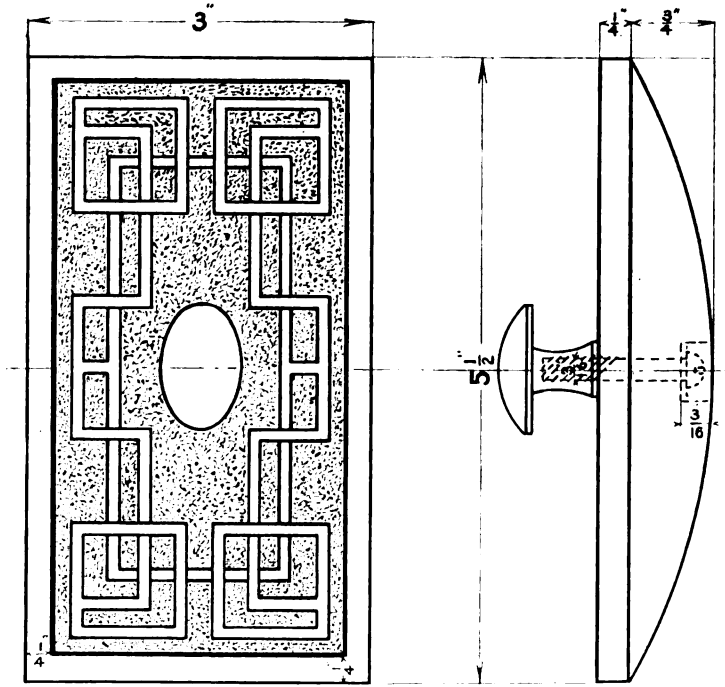
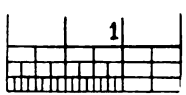


Scale



A.M. Leavitt, Boston, Mass

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Tooth Brush Holder

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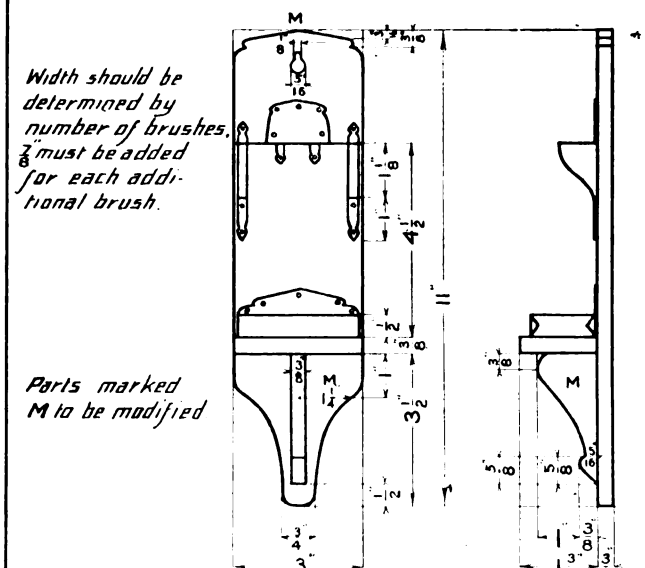
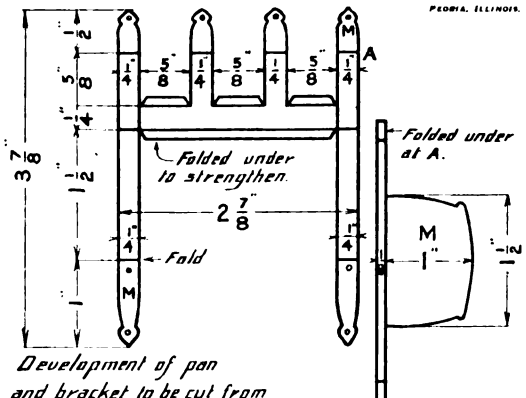
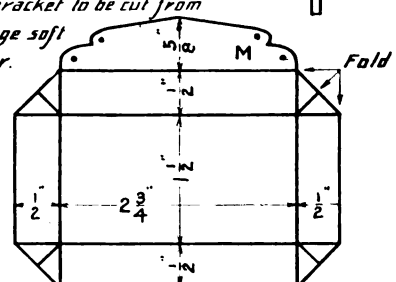

M
Width should be determined by number of brushes. 7/8" must be added for each additional brush.
Parts marked M to be modified
11"
4 1/2"
3 1/2"
3"



Development of pan and bracket to be cut from 28 gauge soft copper.



MWM

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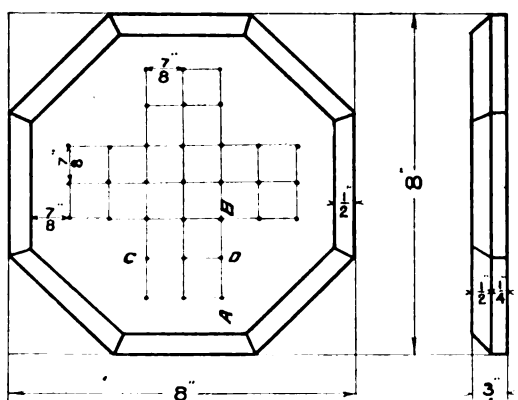
Solitaire Board

Escutcheon pins (1"-14) used for men



Holes bored with No. 52 drill.

The puzzle consists in so jumping pins on straight lines [as A B & C. D] that when all pins have been jumped the 32nd is left in the centre hole.

E. L. Winslow, Springfield, Mass.

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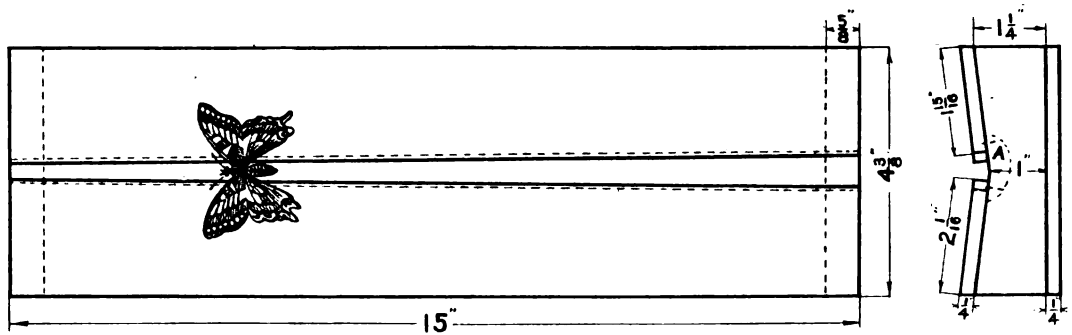
Pressing Board
For Butterflies



Cornstalk inserted at A so that butterflies may be pinned to it.

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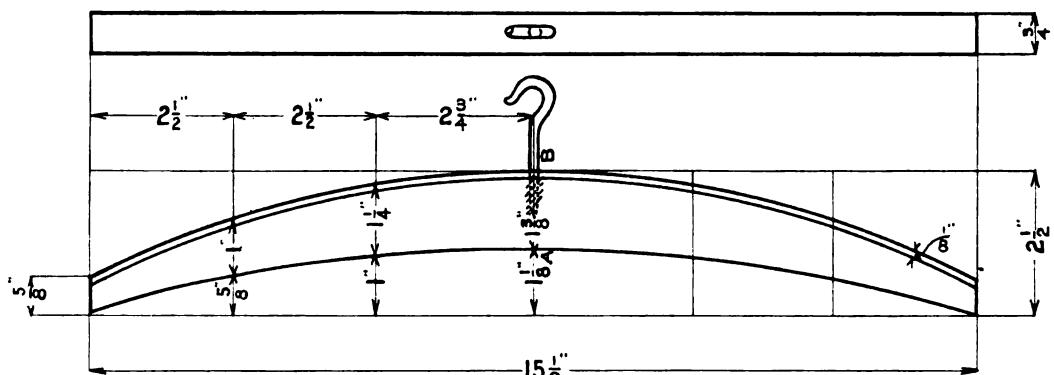
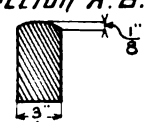
Coat Hanger



Section A. B.



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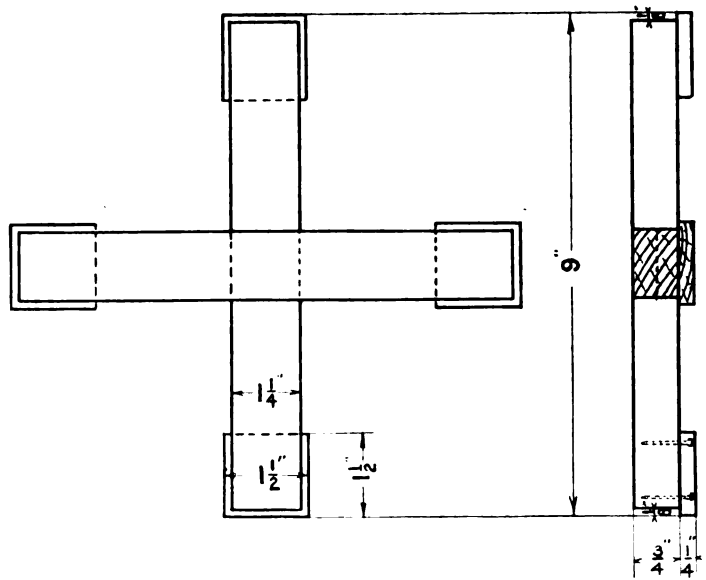
Flower Pot Stand



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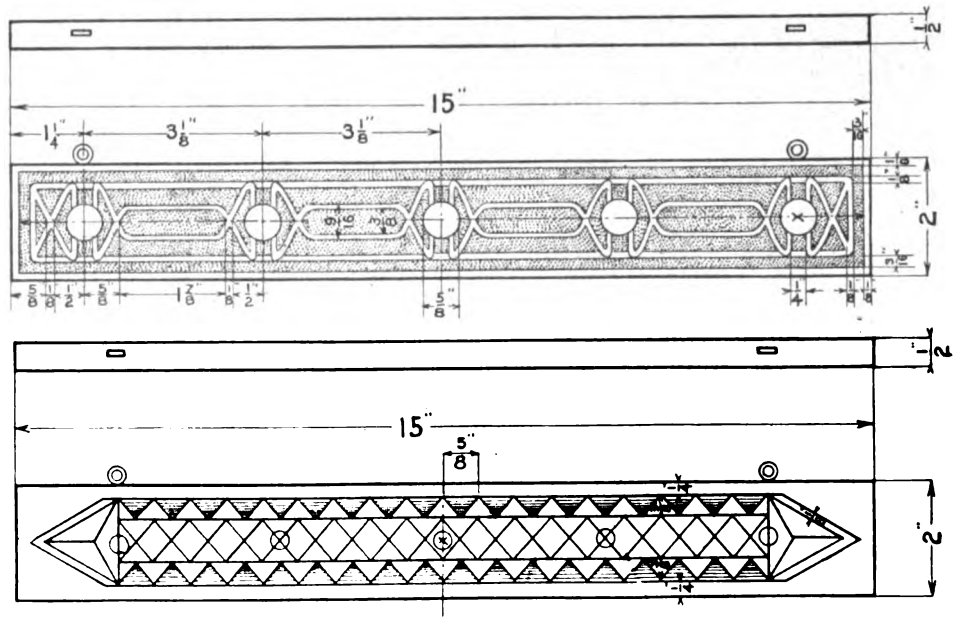
Key Boards



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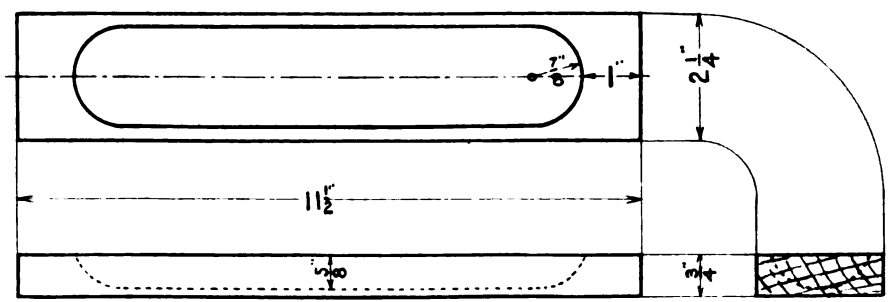
Pen Tray



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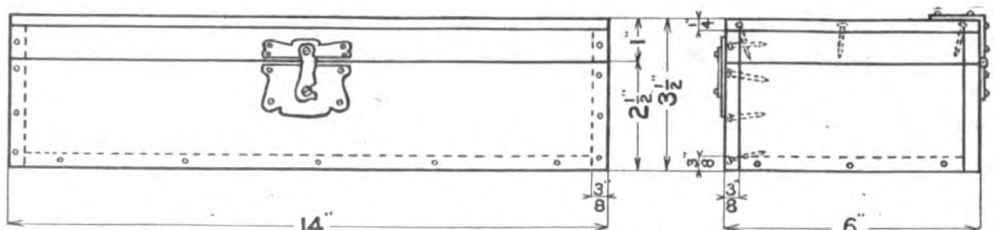
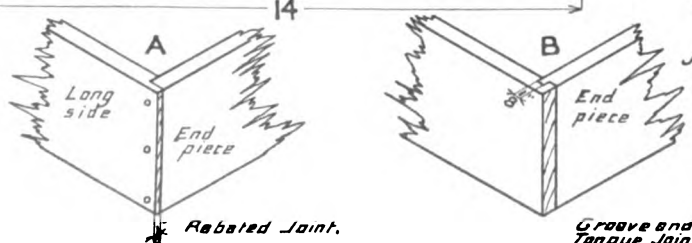
Box





Rebated Joint.

Groove and Tongue Joint.

Joint A or B may be used instead of Butt Joint.

Catch and hinges may be designed and made from 25 gauge soft copper.

Size of box should be determined by the purpose for which it is intended.

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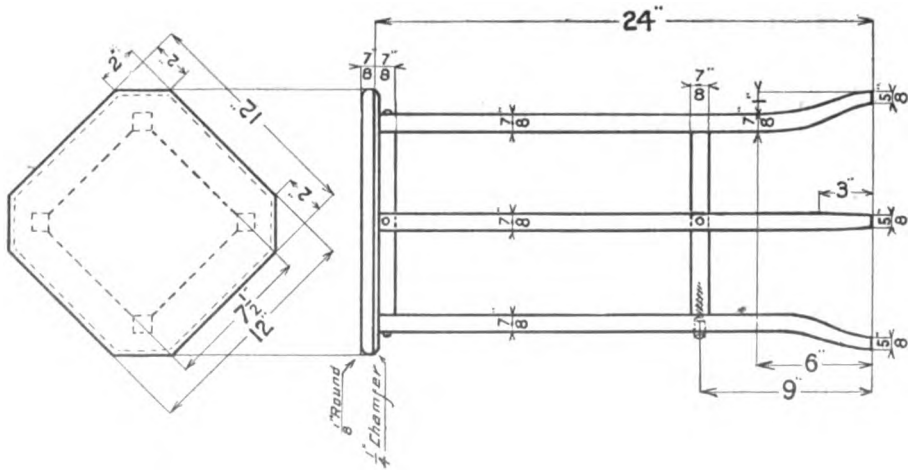
Flower Table



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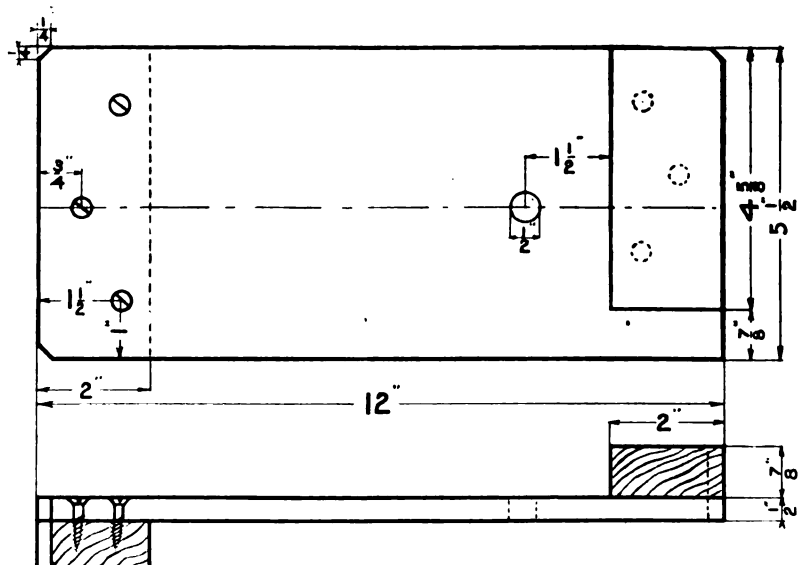
Bench Hook



Grain of wood may be made to run the same way in all pieces.

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Drawing Board and T Square

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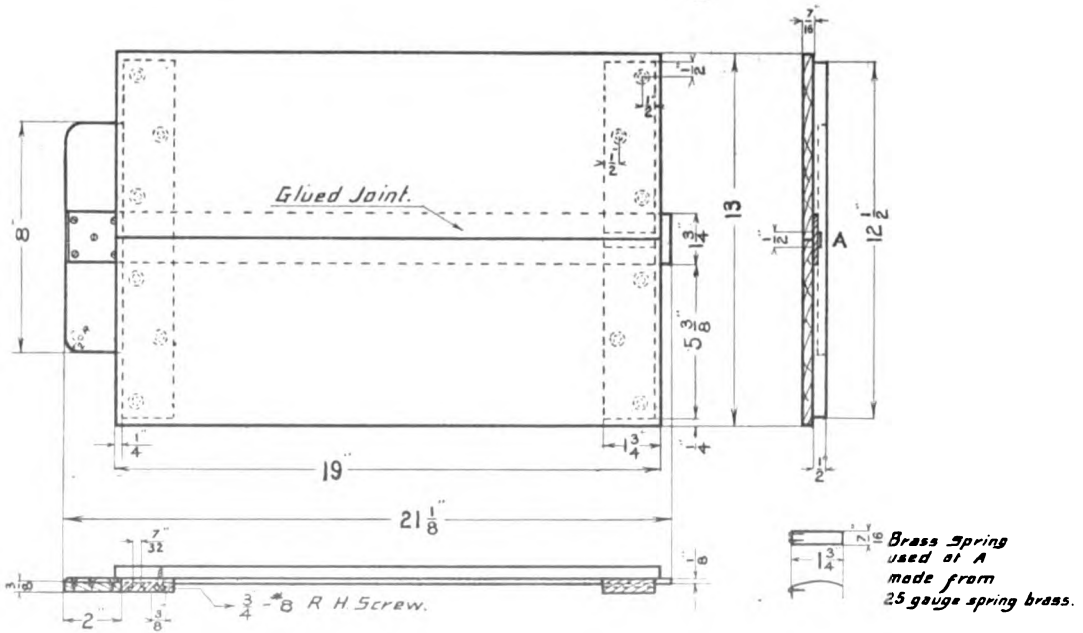

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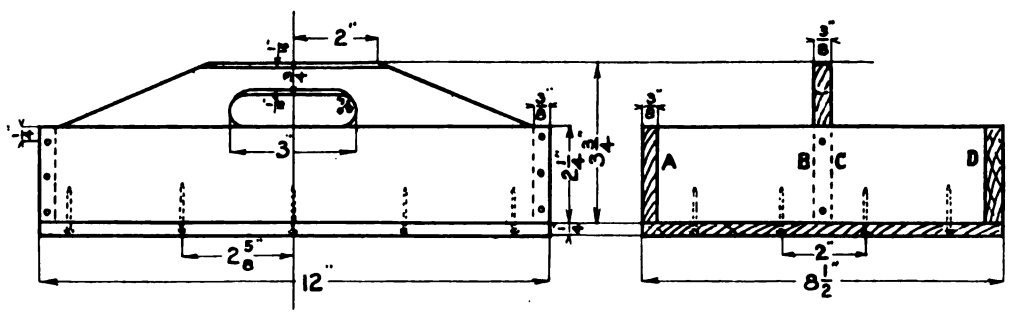
Knife Box



This box may be made with partitions from A to B, and C to D, and be used as a nail box.

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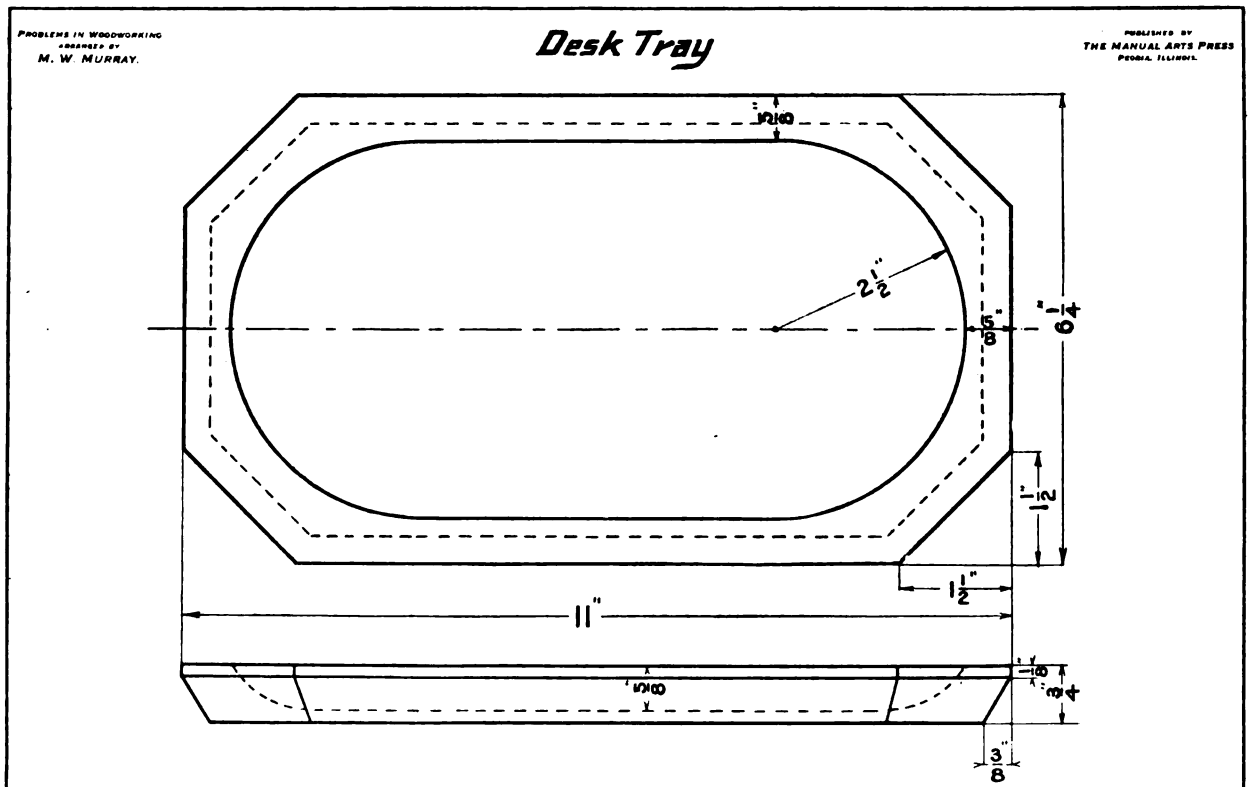

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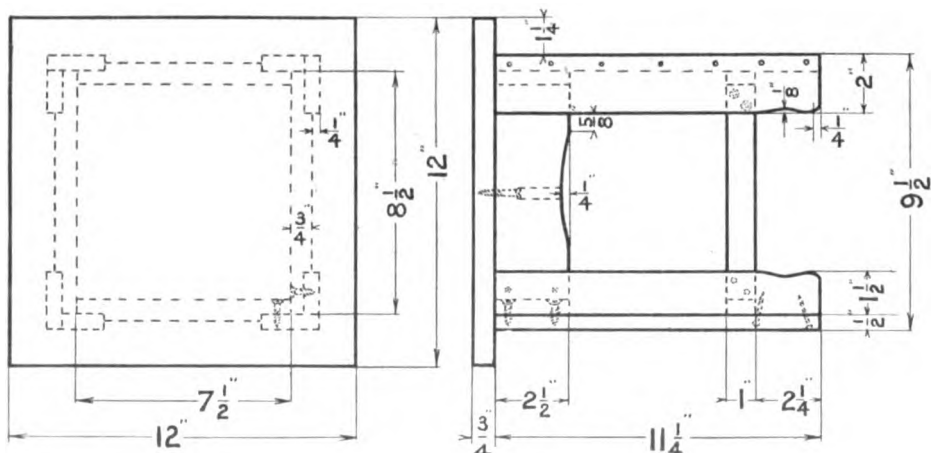

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Canoe Paddle

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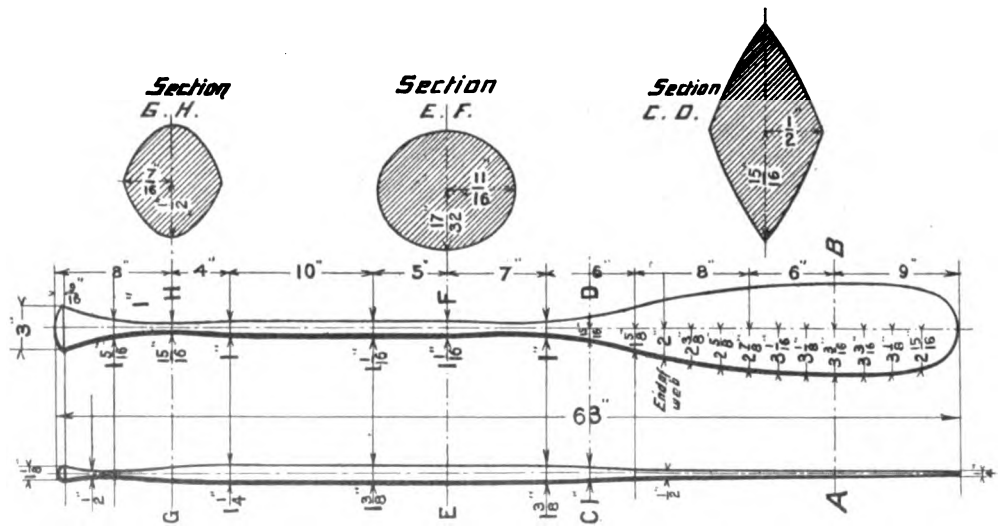

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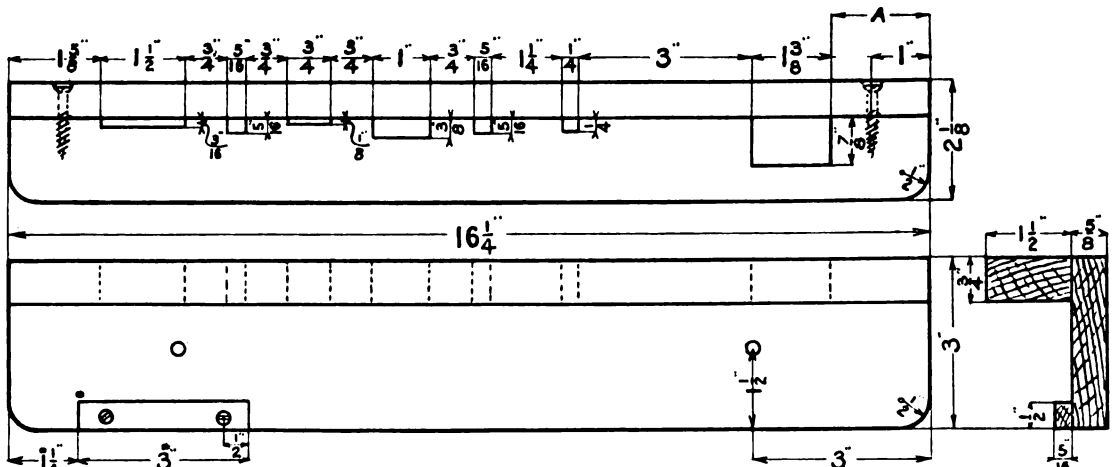
Tool Rack



Cuts may be made to suit the number and size of tools.
Distance A to be found.

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Coat and Trousers Hanger

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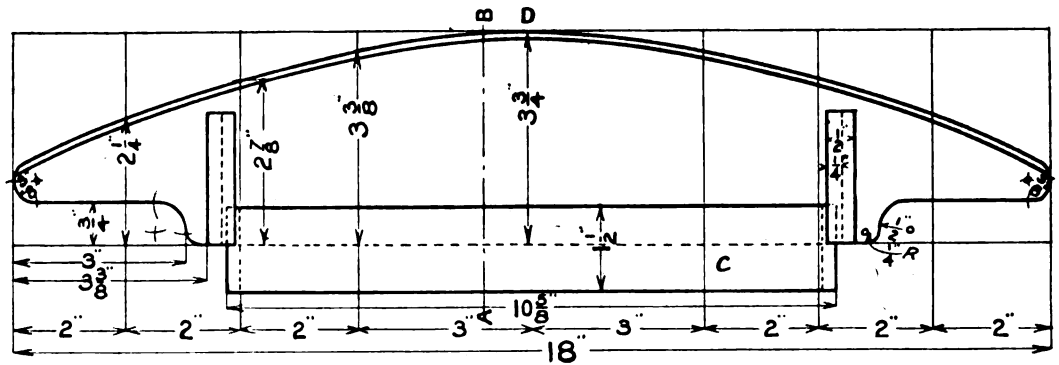
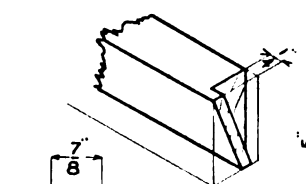
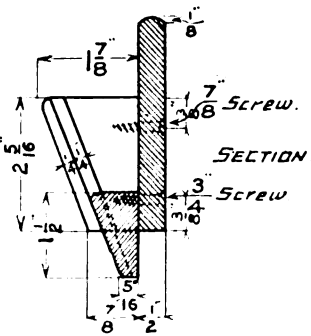




Right end views of cross piece C.



SECTION on A.B.

White Wood.

Hook at D.

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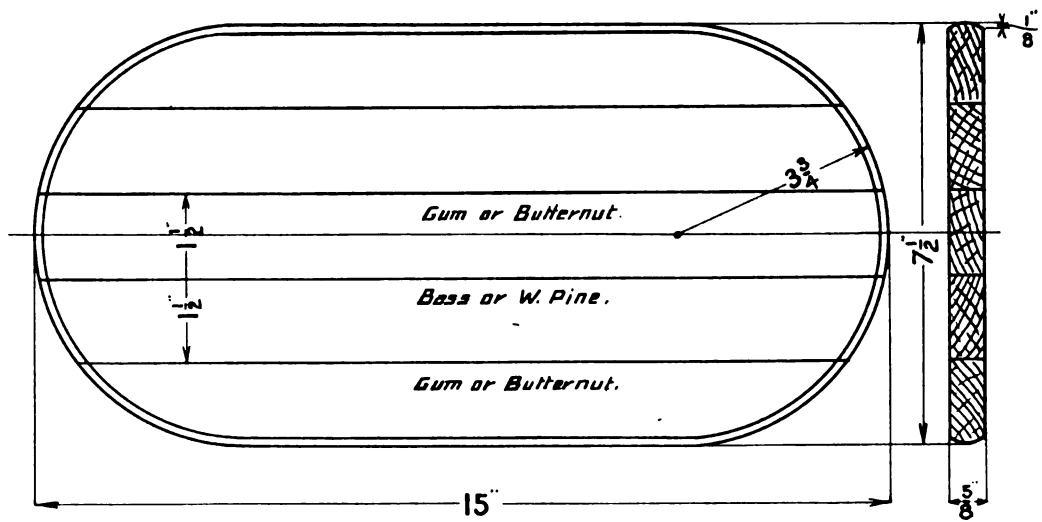
Bread Board



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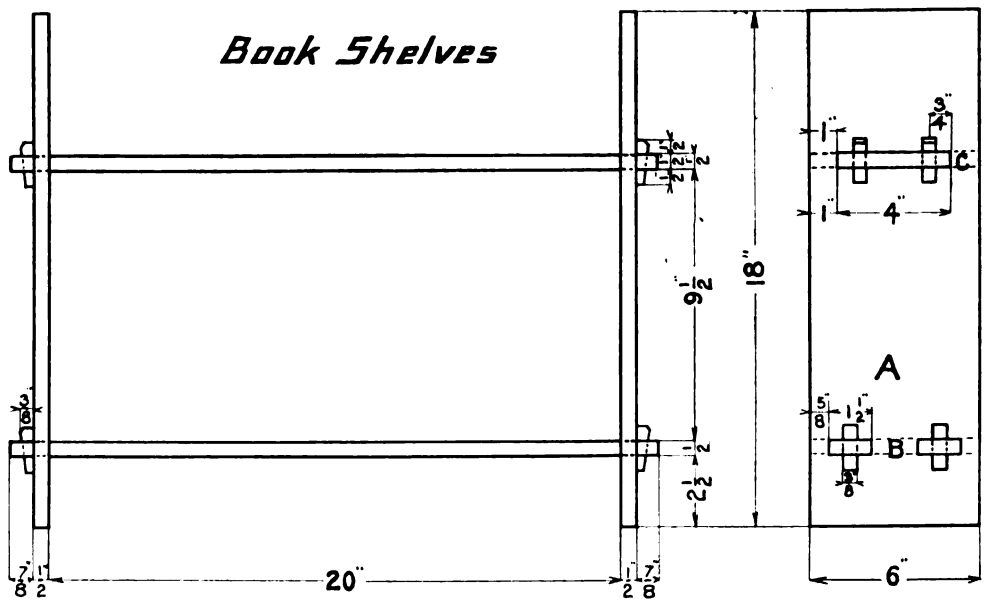
Book Shelves



End A. to be designed. Joint B or C may be used, or both.

Length of shelves and distance apart should be determined by number and size of the books.

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Umbrella Stand

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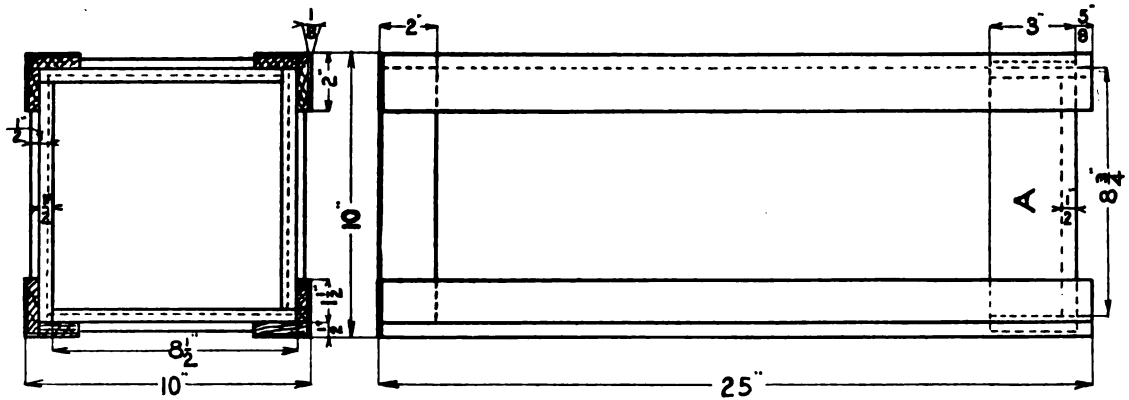

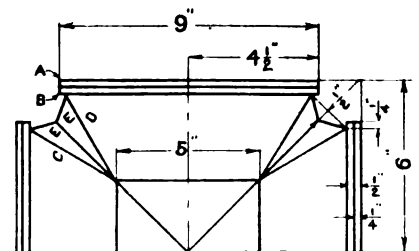

Development of half of copper pan used at A. (26 gauge soft copper 12" square used) Fold so that line A falls on B; bring the sides up until C meets D, then fold double piece formed by E E, under on the bottom of pan

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Printing Frame

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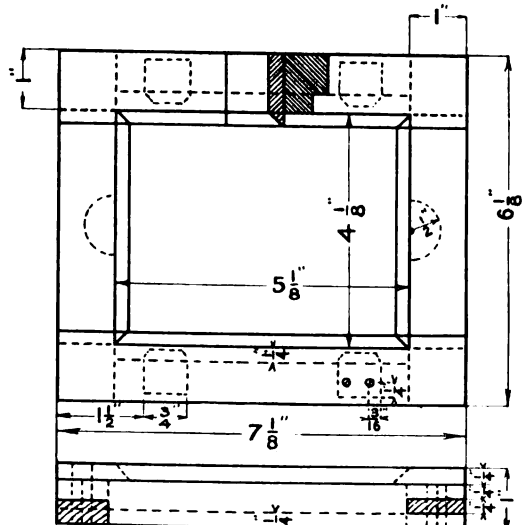

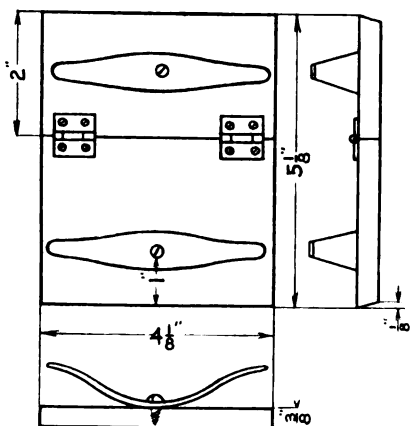

Back piece showing springs

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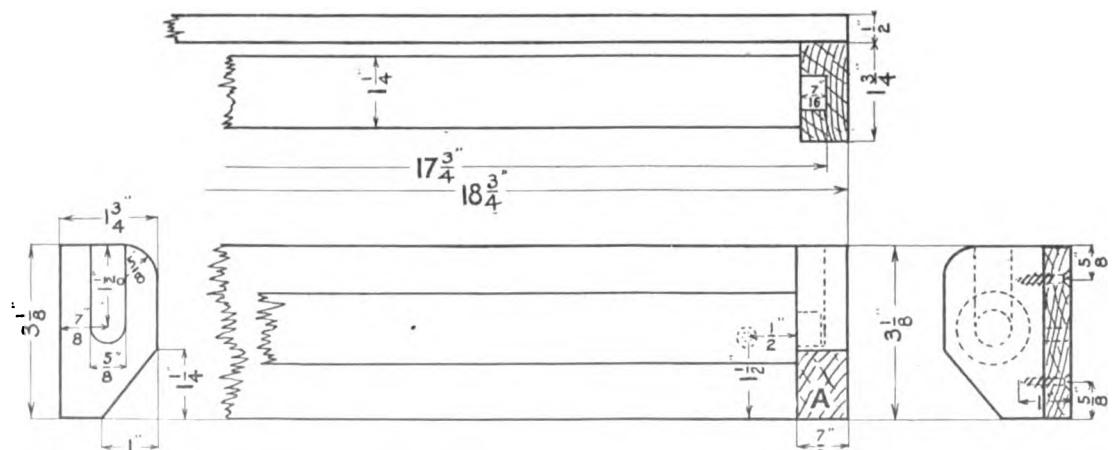
Towel Roller



Left side view of
BRACKET A.

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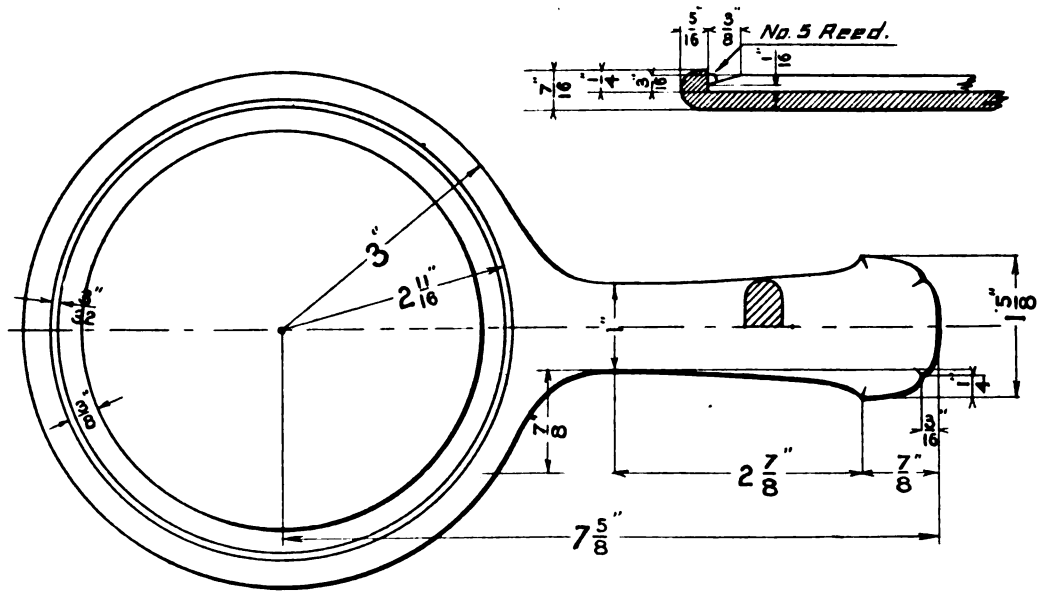
Mirror



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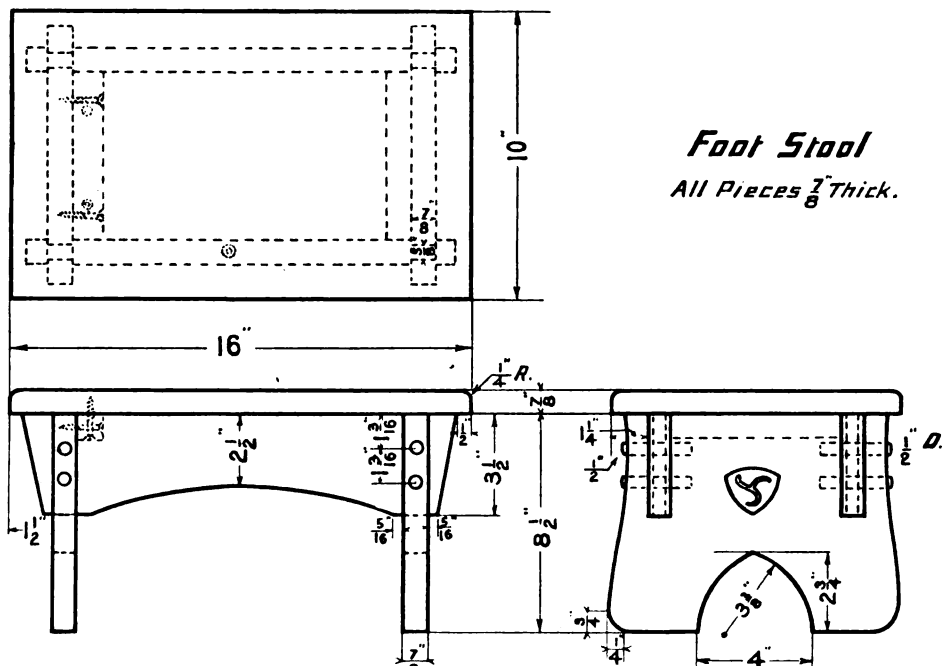

Foot Stool

All Pieces 7/8" Thick.

Handicraft Club, Peoria, Ill.

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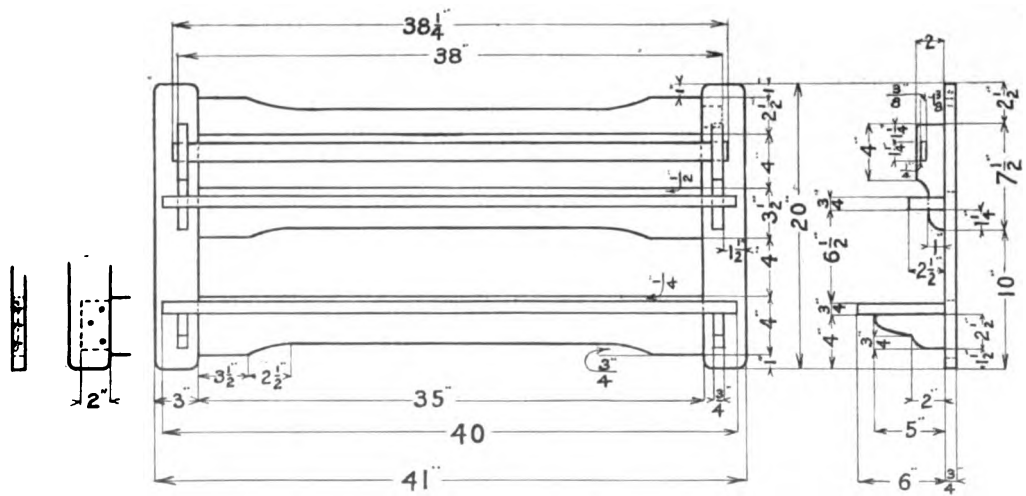
Plate Rack



Joints — Dowel, Mortise-and-Tenon or joint shown may be used
Shelves have front corners rounded and are screwed on from the back

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Towel Rack

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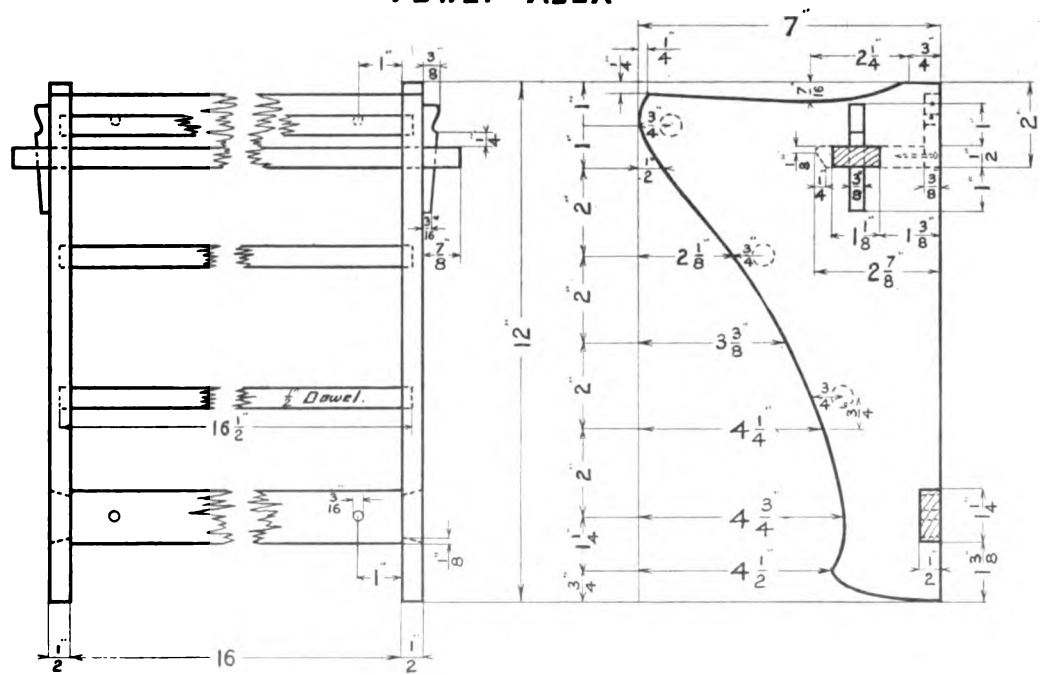

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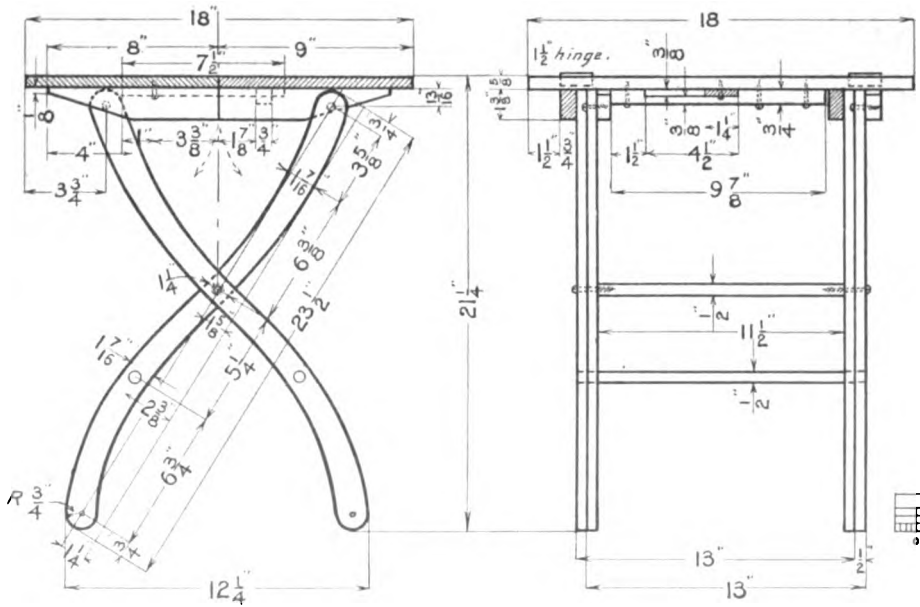
Folding Table



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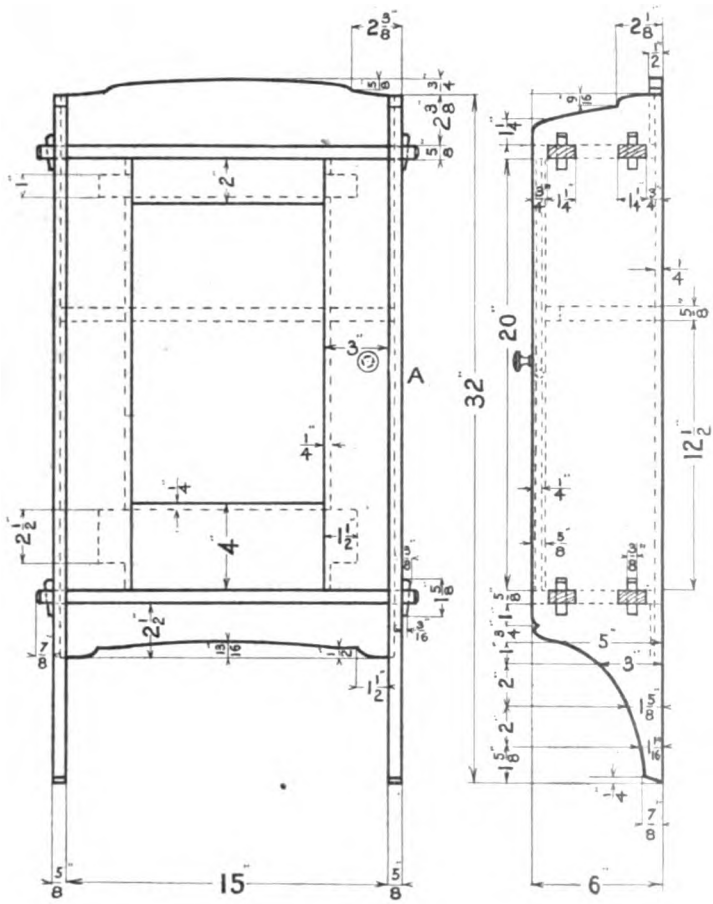
Medicine Cabinet



Fogg catch used at A.

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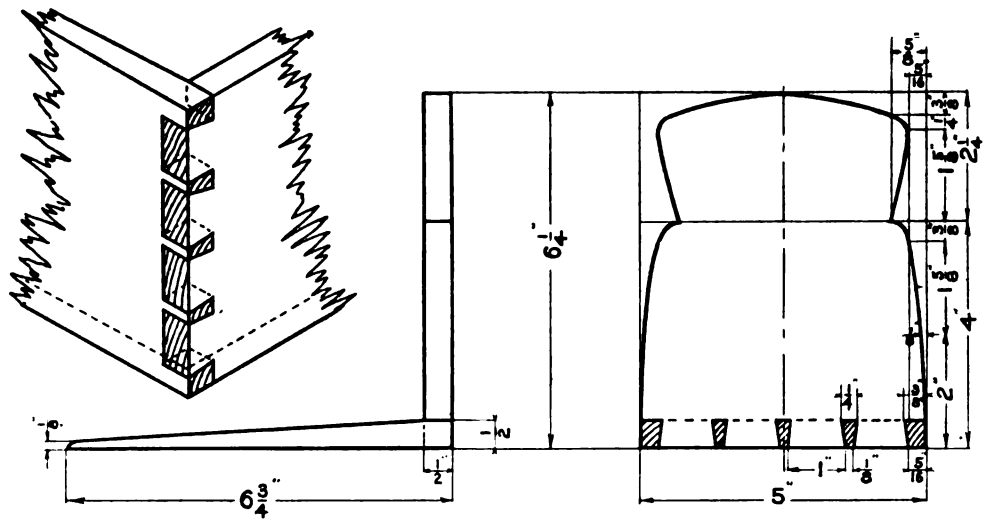
Dovetailed Book Rack



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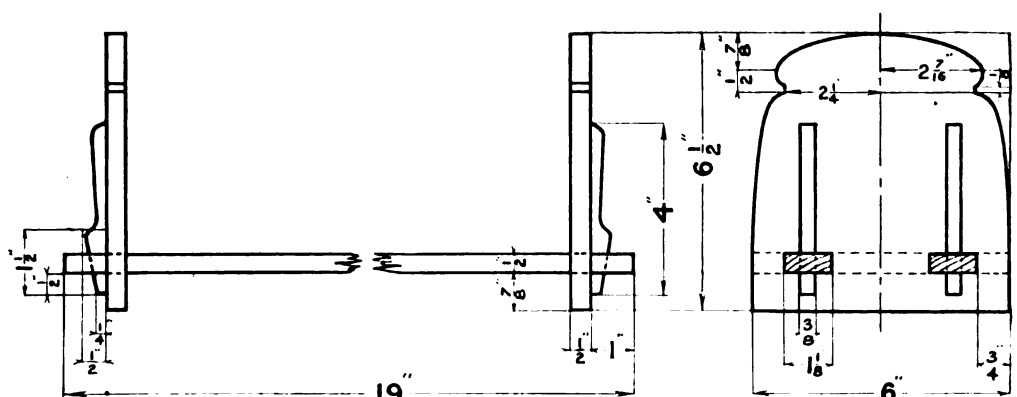

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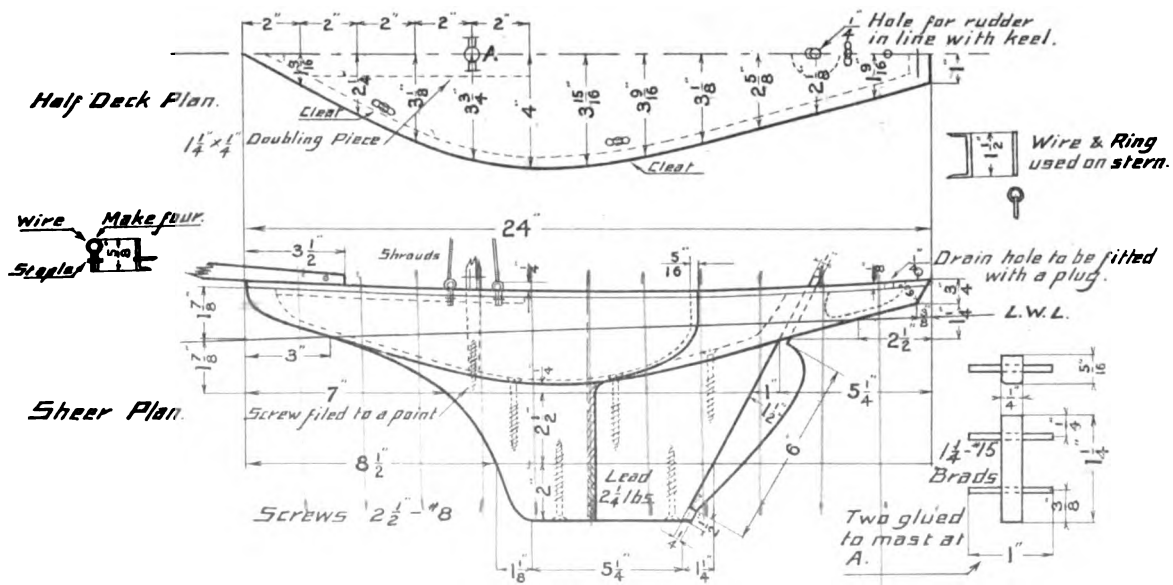
Model Yacht Hull



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Model Yacht
Sail Plan

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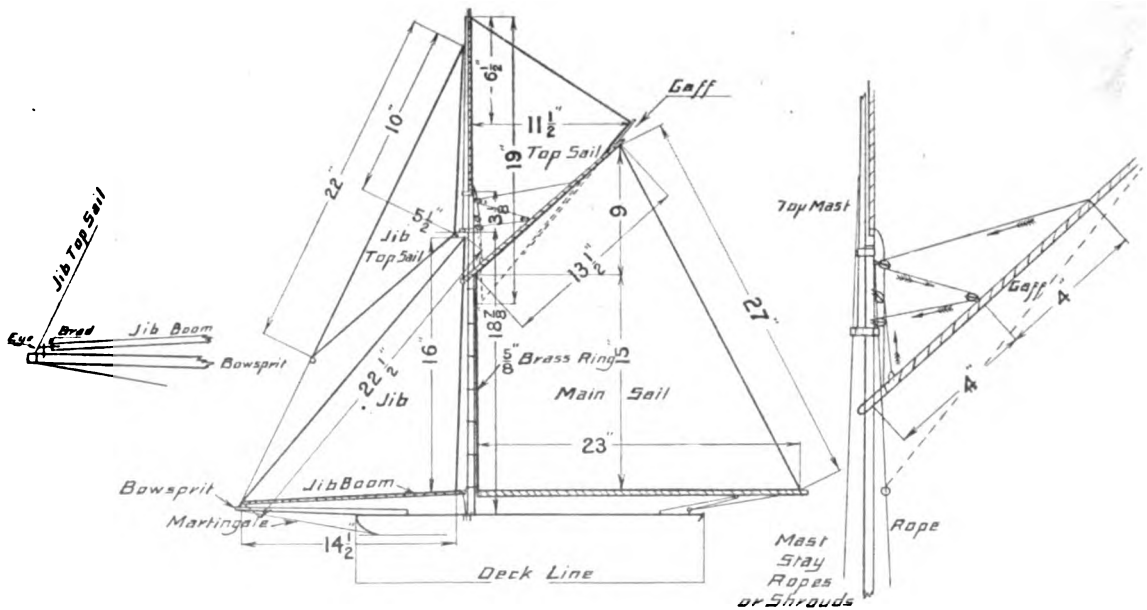

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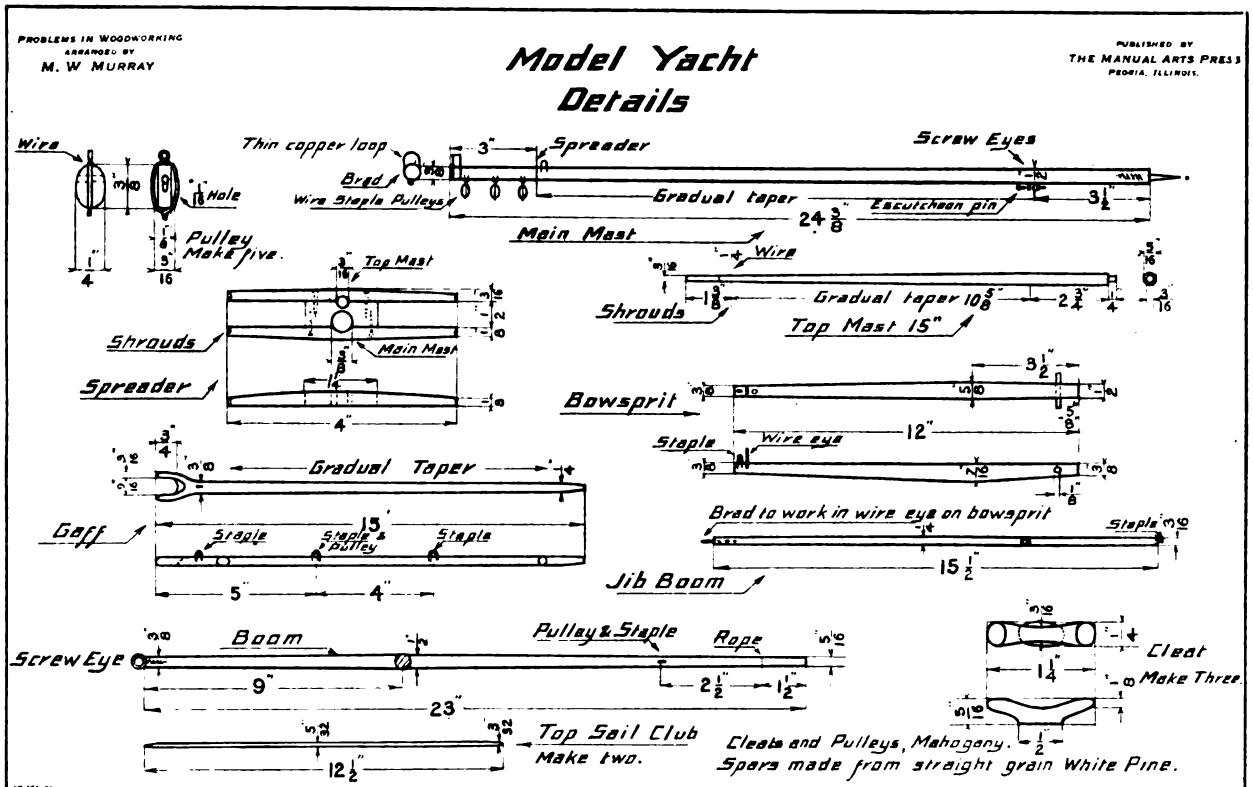

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